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Total pages: 18
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Product Spec
PS04W4S V0 LED

MODEL NAME: PS04W4S V0

< > Preliminary Specification

< ◆ > Final Specification

MAKER			CUSTOMER			
Prepared	Checked	Approved				
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Product Specification

LEXTAR ELECTRONICS CORPORATION

Record of Revision

Version and Date	Page	Old description	New Description	Remark
0.0 2020/06/18	All	Preliminary Spec.		
0.1 2020/06/29	All	Preliminary Spec.		
0.2 2020/09/11	All	Preliminary Spec.	Update 1.3.2 Forward Voltage Rank 1.3.3 Chip Dominant Wavelength Groups	
0.3 2021/01/19	4 7-11	Preliminary Spec.	Update 1.3.1 Luminous Intensity Rank 1.3.3 Chip Dominant Wavelength Groups 2.1 Test items 3 INITIAL OPTICAL/ELECTRICAL CHARACTERISTICS	
0.3 2021/03/26	9	-	Update 3.4 Forward Current vs. Relative Luminosity	

SPECIFICATION

1.1 Absolute Maximum Ratings

(Ts=25°C)

Item	Symbol	Absolute Maximum Rating	Unit
Forward Current	I_F	30	mA
Pulse Forward Current *	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Power Dissipation	P_D	105	mW
Electrostatic Discharge	ESD	2000	V
Operating Temperature	T_{opr}	-30 ~ + 85	°C
Storage Temperature	T_{stg}	-40 ~ +100	°C
Soldering Temperature	T_{sld}	Reflow Soldering : 245 (10sec) Hand Soldering : 350 (3sec)	°C

*1 IFP Condition: Duty 1/10, Pulse within 10msec.

*2 ESD is according to HBM test method: MIL-STD-883G method 3015.7.

*3 Max Rating Condition by 1000hrs RA ,function pass.

1.2 Initial Electrical/Optical Characteristics

(Ts=25°C)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	$I_F=20\text{ mA}$	2.7	2.9	3.4	V
		$I_F=10\mu\text{A}$	2.2	2.4	-	V
Reverser Current	I_R	$I_R=5\text{ V}$	-	-	10	μA
Luminous Intensity	I_v	$I_F=20\text{ mA}$	3146	-	3586	mcd
View Angle	$2\theta_{1/2}$	$I_F=20\text{ mA}$	-	120	-	degree
Chromaticity Coordinate *	x	0.323	$I_F=20\text{ mA}$	Refer to ranking table		-
	y	0.323	$I_F=20\text{ mA}$			

* Chromaticity Coordinate follow CIE1931.

1.3 Ranking

1.3.1 Luminous Intensity Rank

(Ts=25°C)

Item	Symbol	Condition	Min.	Max.	Unit	5-Number Bin Code
Rank F	Iv	IF =20 mA	2970	3058	mcd	F
Rank G			3058	3146	mcd	G
Rank H			3146	3234	mcd	H
Rank J			3234	3322	mcd	J
Rank K			3322	3410	mcd	K
Rank L			3410	3498	mcd	L
Rank M			3498	3586	mcd	M
Rank N			3586	3674	mcd	N

*Luminous Intensity Measurement allowance is $\pm 5\%$

1.3.2 Forward Voltage Rank (Ts=25°C)

Item	Symbol	Condition	Min.	Max.	Unit	5-Number Bin Code
Forward Voltage*	Vf	IF = 20mA	2.7	2.8	V	W
			2.8	2.9		X
			2.9	3.0		1

* The Forward Voltage tolerance is $\pm 0.05V$.

1.3.3 Chip Dominant Wavelength Groups

(Ts=25°C, IF=20mA)

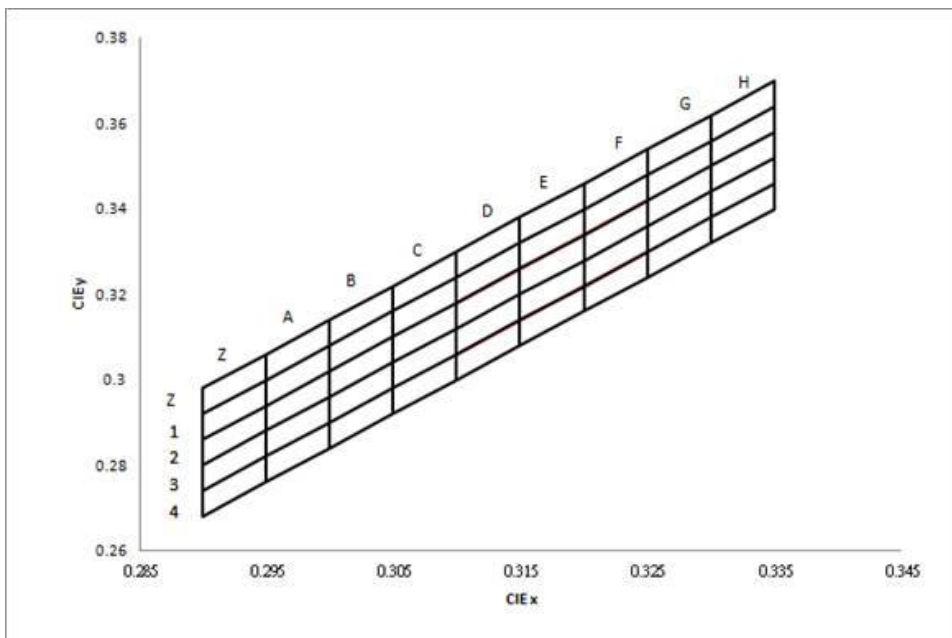
Chip Dominant Wavelength Groups				
Group	Min	Max	unit	5-Number Code
WD 3	450.0	452.5	nm	3
WD 4	452.5	455.0	nm	4
WD 5	455.0	457.5	nm	5
WD 6	457.5	460.0	nm	6
WD 7	460.0	462.5	nm	7
WD 8	462.5	465.0	nm	8

Peak Wavelength Measurement allowance is $\pm 1nm$

1.3.4 Color Rank

($I_f=20mA, T_s=25^\circ C$)

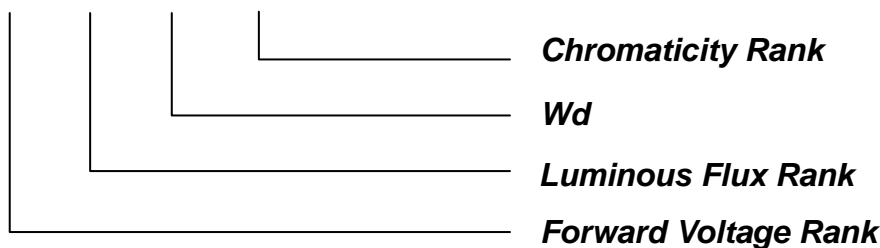
	Z		A		B		C		D		E		F		G		H	
Z	0.2900	0.2920	0.2950	0.3000	0.3000	0.3080	0.3050	0.3160	0.3100	0.3240	0.3150	0.3320	0.3200	0.3400	0.3250	0.3480	0.3300	0.3560
	0.2900	0.2980	0.2950	0.3060	0.3000	0.3140	0.3050	0.3220	0.3100	0.3300	0.3150	0.3380	0.3200	0.3460	0.3250	0.3540	0.3300	0.3620
	0.2950	0.3060	0.3000	0.3140	0.3050	0.3220	0.3100	0.3300	0.3150	0.3380	0.3200	0.3460	0.3250	0.3540	0.3300	0.3620	0.3350	0.3700
	0.2950	0.3000	0.3000	0.3080	0.3050	0.3160	0.3100	0.3240	0.3150	0.3320	0.3200	0.3400	0.3250	0.3480	0.3300	0.3560	0.3350	0.3640
1	0.2900	0.2860	0.2950	0.2940	0.3000	0.3020	0.3050	0.3100	0.3100	0.3180	0.3150	0.3260	0.3200	0.3340	0.3250	0.3420	0.3300	0.3500
	0.2900	0.2920	0.2950	0.3000	0.3000	0.3080	0.3050	0.3160	0.3100	0.3240	0.3150	0.3320	0.3200	0.3400	0.3250	0.3480	0.3300	0.3560
	0.2950	0.3000	0.3000	0.3080	0.3050	0.3160	0.3100	0.3240	0.3150	0.3320	0.3200	0.3400	0.3250	0.3480	0.3300	0.3560	0.3350	0.3640
	0.2950	0.2940	0.3000	0.3020	0.3050	0.3100	0.3100	0.3180	0.3150	0.3260	0.3200	0.3340	0.3250	0.3420	0.3300	0.3500	0.3350	0.3580
2	0.2900	0.2800	0.2950	0.2880	0.3000	0.2960	0.3050	0.3040	0.3100	0.3120	0.3150	0.3200	0.3200	0.3280	0.3250	0.3360	0.3300	0.3440
	0.2900	0.2860	0.2950	0.2940	0.3000	0.3020	0.3050	0.3100	0.3100	0.3180	0.3150	0.3260	0.3200	0.3340	0.3250	0.3420	0.3300	0.3500
	0.2950	0.2940	0.3000	0.3020	0.3050	0.3100	0.3100	0.3180	0.3150	0.3260	0.3200	0.3340	0.3250	0.3420	0.3300	0.3500	0.3350	0.3580
	0.2950	0.2880	0.3000	0.2960	0.3050	0.3040	0.3100	0.3120	0.3150	0.3200	0.3200	0.3280	0.3250	0.3360	0.3300	0.3440	0.3350	0.3520
3	0.2900	0.2740	0.2950	0.2820	0.3000	0.2900	0.3050	0.2980	0.3100	0.3060	0.3150	0.3140	0.3200	0.3220	0.3250	0.3300	0.3300	0.3380
	0.2900	0.2800	0.2950	0.2880	0.3000	0.2960	0.3050	0.3040	0.3100	0.3120	0.3150	0.3200	0.3200	0.3280	0.3250	0.3360	0.3300	0.3440
	0.2950	0.2880	0.3000	0.2960	0.3050	0.3040	0.3100	0.3120	0.3150	0.3200	0.3200	0.3280	0.3250	0.3360	0.3300	0.3440	0.3350	0.3520
	0.2950	0.2820	0.3000	0.2900	0.3050	0.2980	0.3100	0.3060	0.3150	0.3140	0.3200	0.3220	0.3250	0.3300	0.3300	0.3380	0.3350	0.3460
4	0.2900	0.2680	0.2950	0.2760	0.3000	0.2840	0.3050	0.2920	0.3100	0.3000	0.3150	0.3080	0.3200	0.3160	0.3250	0.3240	0.3300	0.3320
	0.2900	0.2740	0.2950	0.2820	0.3000	0.2900	0.3050	0.2980	0.3100	0.3060	0.3150	0.3140	0.3200	0.3220	0.3250	0.3300	0.3300	0.3380
	0.2950	0.2820	0.3000	0.2900	0.3050	0.2980	0.3100	0.3060	0.3150	0.3140	0.3200	0.3220	0.3250	0.3300	0.3300	0.3380	0.3350	0.3460
	0.2950	0.2760	0.3000	0.2840	0.3050	0.2920	0.3100	0.3000	0.3150	0.3080	0.3200	0.3160	0.3250	0.3240	0.3300	0.3320	0.3350	0.3400



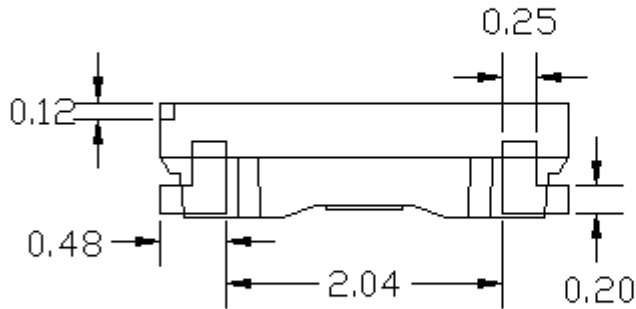
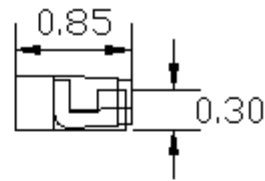
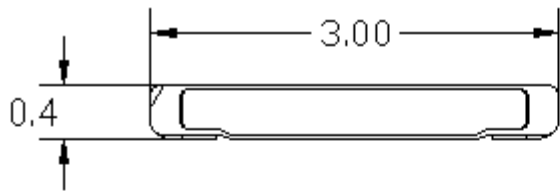
*Color Coordinates Measurement allowance is ± 0.005 .

BinCode definition

W B 2 E1



1.4 Outline Dimension & Recommended Solder Pattern



Unit: mm
Tolerances: ± 0.10



Pin connection



Note: If the Bottom-Lead electrode contact the metal, it must be short.

2 RELIABILITY

2.1 TEST ITEMS

No	Items ^[1]	Temperature	Humidity	Other condition	Hrs	Times	Sampling
		(°C)	(%)				
1	Steady State Operating Life of High Temperature	85	--	I _F =8.5mA	1000	--	20
2	Steady State Operating Life of High Humidity Heat	85	85	I _F =8.5mA	1000		20
3	Steady State Operating Life of High Humidity Heat	60	90	I _F =20mA	1000	--	20
4	Steady State Operating Life of High Humidity Heat	60	60	I _F =20mA	3000		20
5	Steady State Operating Life of Low Temperature	-40	--	I _F =20mA	1000	--	20
6	On/Off testing	60	Room Humidity	I _F =20mA 10secON /10secOFF 35000 circular Continue	195	--	20
7	Thermal Shock	--	--	-40°C ~ 100°C 20min. 20sec 20min	--	200 cycles	20
8	Resistance to Soldering Heat (Reflow Soldering)	--	--	(Pre- store @ 25°C, 60%RH for 168hrs) T _{Sld} = 245°C, 10sec.	--	1	20
9	ESD	Room Temp	Room Humidity	HBM ±1~2KV per1 KV		-	20

[1] Test board : 75x75x1 mm, MCPCB circuit board.

[2] All RA test conditions follow MIL-PRF-38535J

2.2 CRITERIA FOR JUDGING DAMAGE

Item	Symbol	Test Condition	Criteria for Judgment	
			Min.	Max.
Forward Voltage	V _F	I _F =20 mA	--	Upper Std Level x1.1
Luminous Intensity	I _v	I _F =20 mA	Lower Std Level x0.7	--

2.3 LIFE

Item	Condition	L50B50.	Unit
Life time [1]	T _s =25°C, I _F =20 mA, RH ≤ 60%	10,000	hrs

[1] Failure means that luminous intensity degrades to 50% of initial value .(L50B50)

The lifetime is estimated by the measured datum at 1Khrs.

[2] Life test condition follows MIL-PRF-38535J

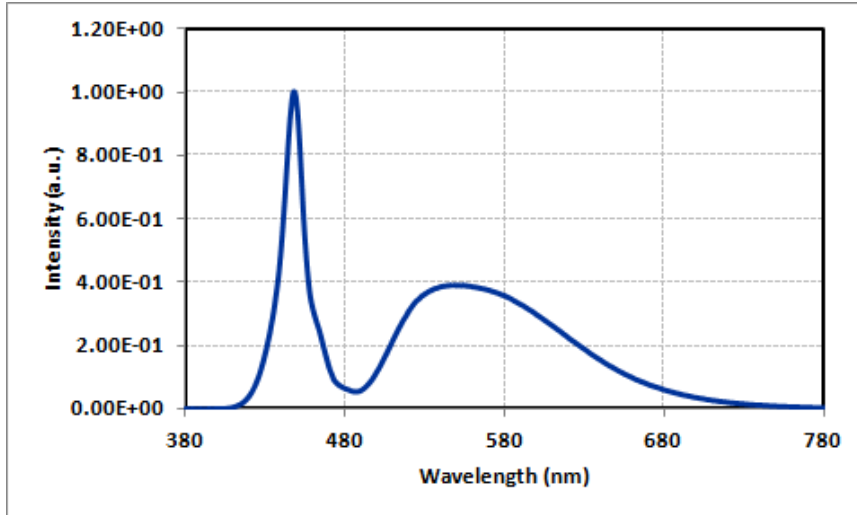
[3] Test board : 75x75x1 mm, MCPCB circuit board.

3 INITIAL OPTICAL/ELECTRICAL CHARACTERISTICS

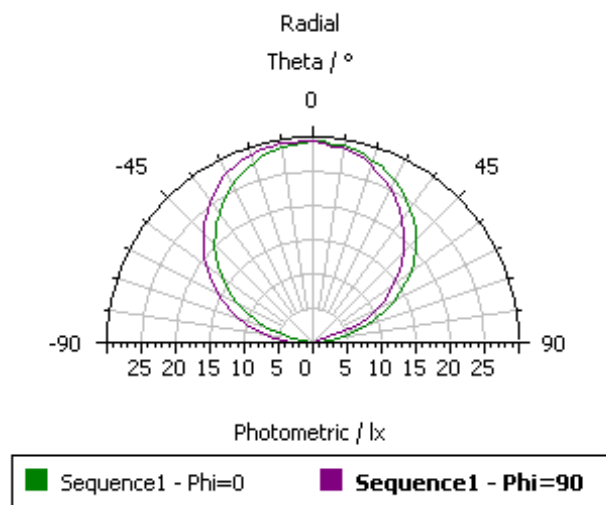
Note: All characteristics are for reference only

3.1 Spectrum

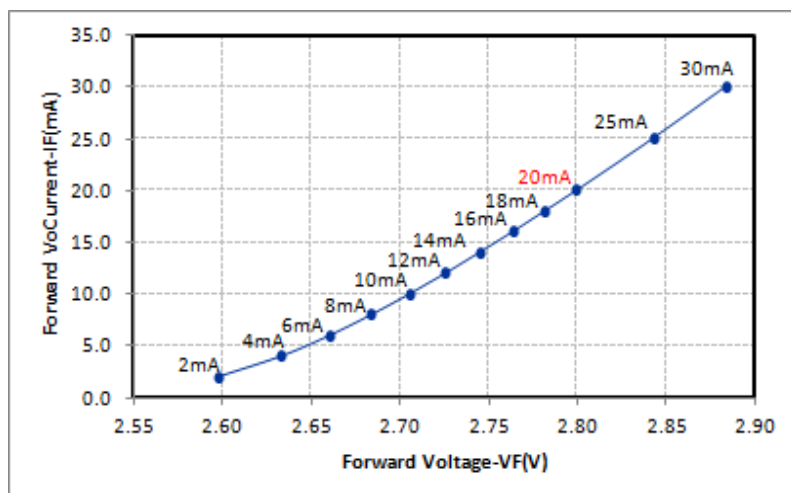
IF=20mA , Ts=25°C



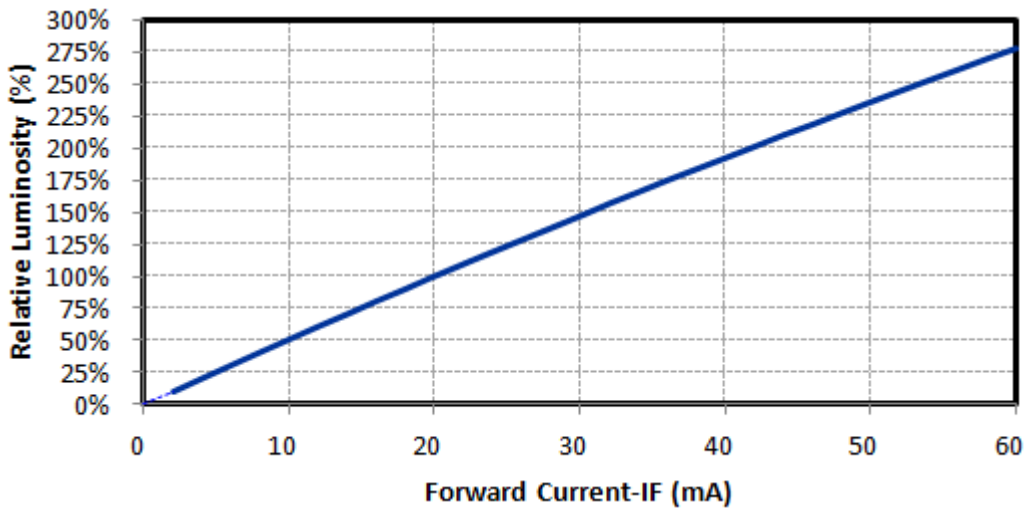
3.2 Directivity



3.3 Forward Voltage vs. Forward Current

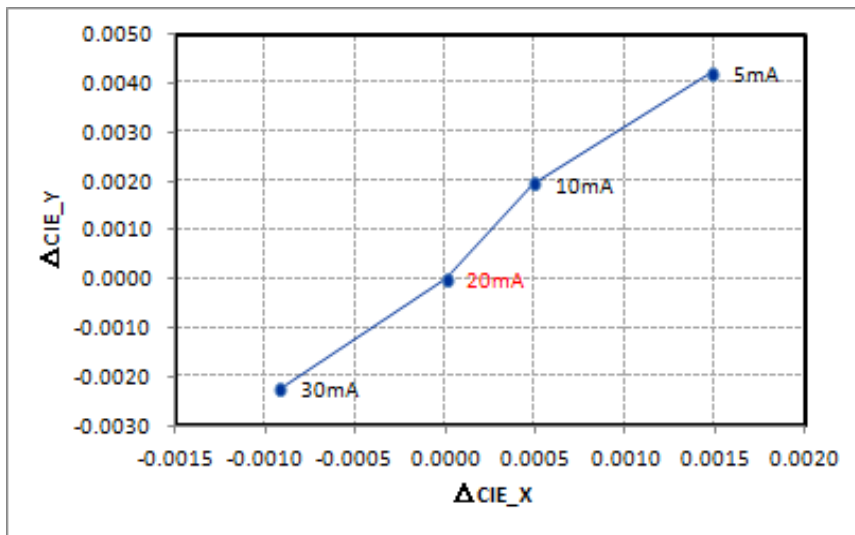


3.4 Forward Current vs. Relative Luminosity

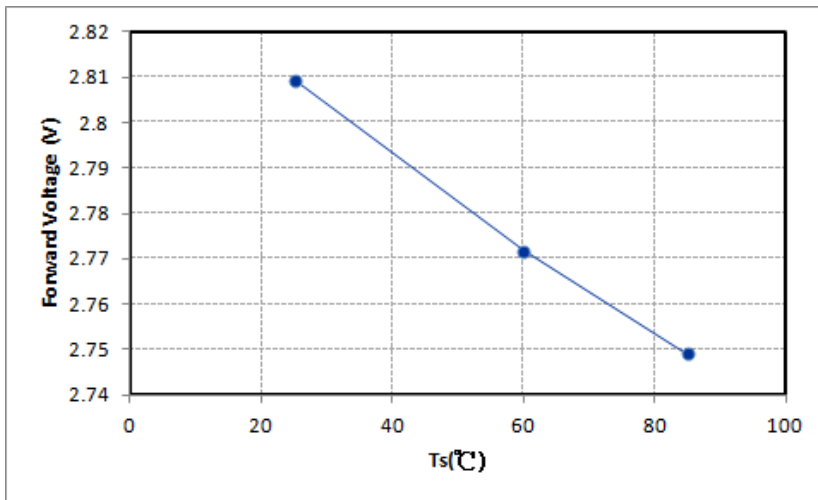


(--- predict line)

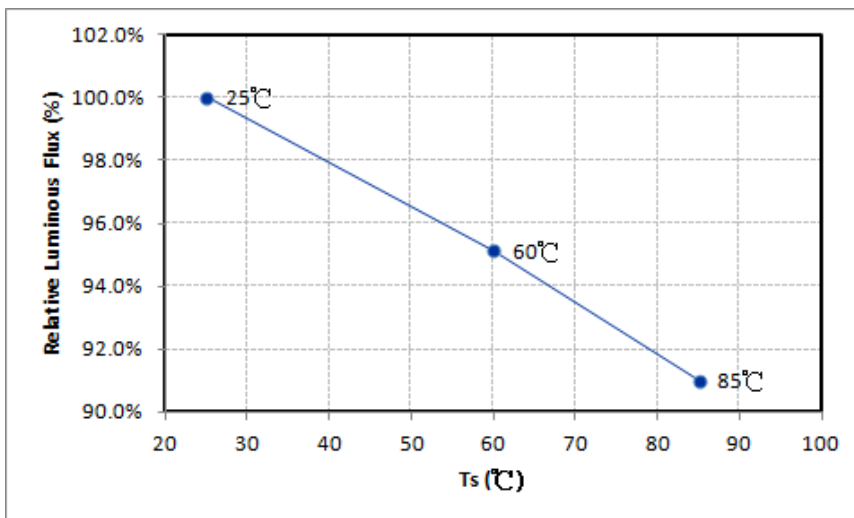
3.5 Forward Current v.s. Chromaticity Coordinate



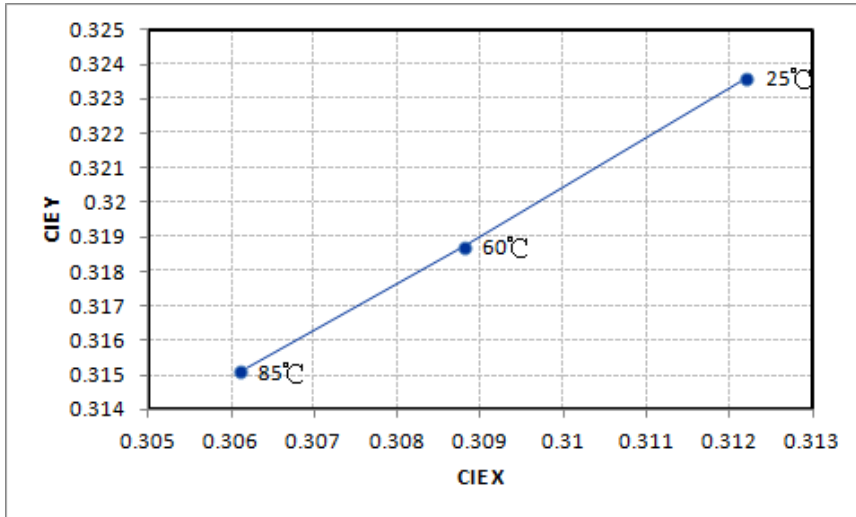
3.6 Forward Voltage Change v.s. Ambient Temperature



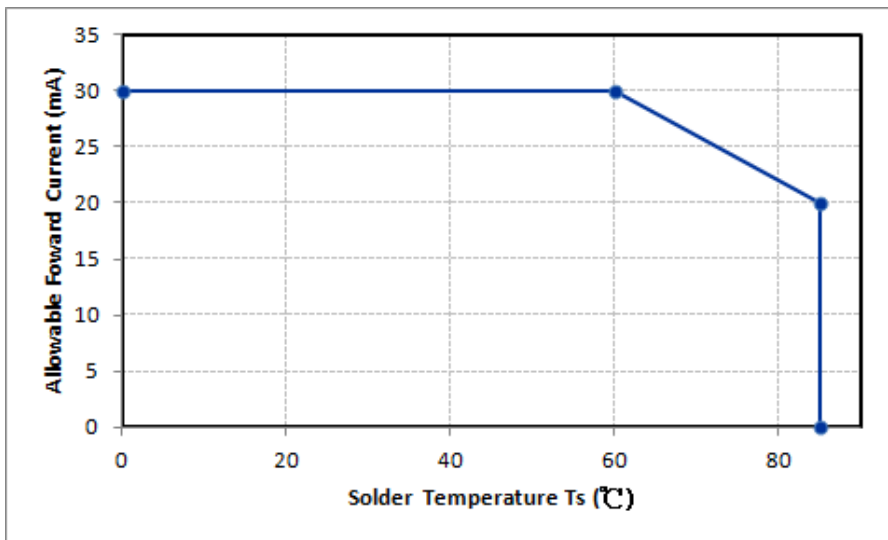
3.7 Relative Luminous Flux v.s. Ambient Temperature



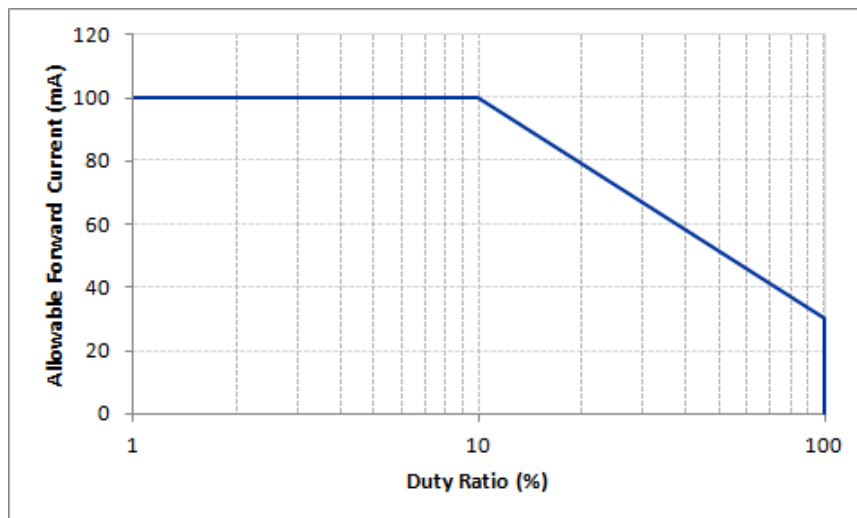
3.8 Chromaticity v.s. Ambient Temperature



3.9 Allowable Forward Current v.s. Solder Temperature



3.10 Allowable Forward Current v.s. Duty ratio

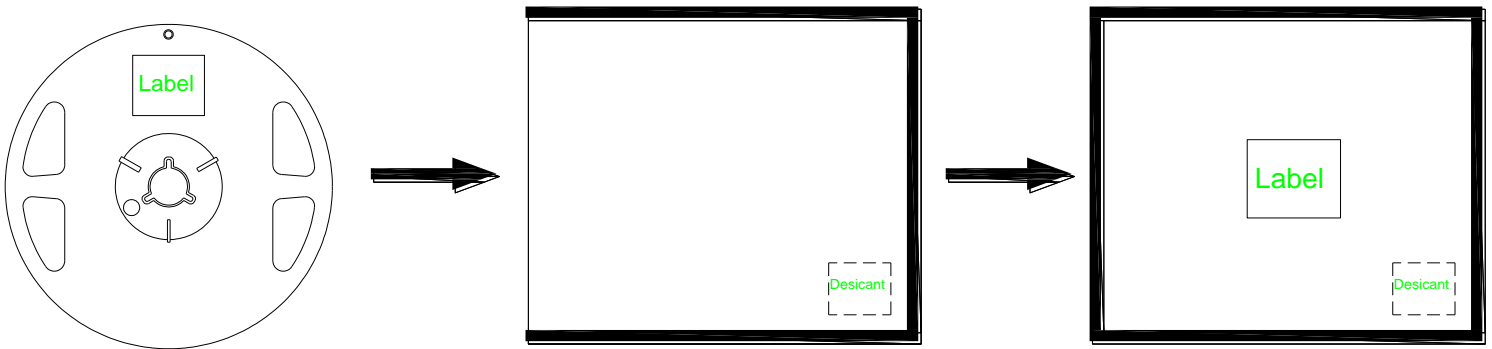


4.0 PACKAGING

The LEDs are packed in cardboard boxes after taping as indicated below. Model name, lot number, and quantity are shown on the label.

Carrier Tape Dimension:

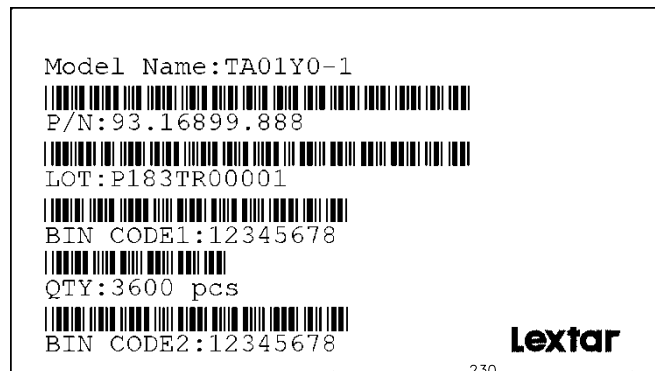
Anti-Static Package:



Label on Reel and Anti-Static Bag :

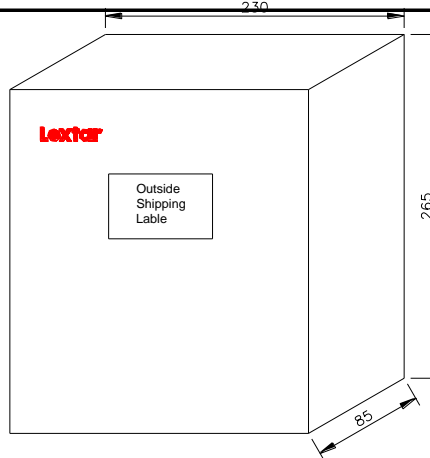
BIN CODE1 : Customer's

BIN CODE2 : Lextar's



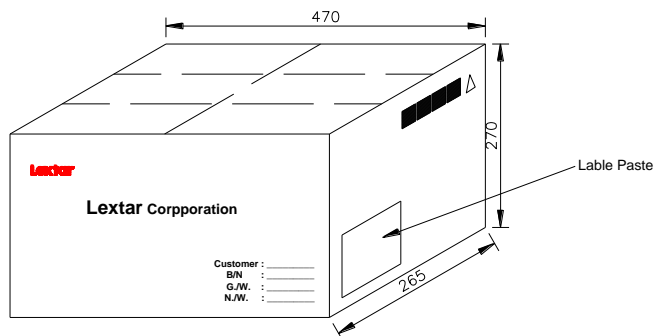
Small-Size Carton :

5 Reels inside



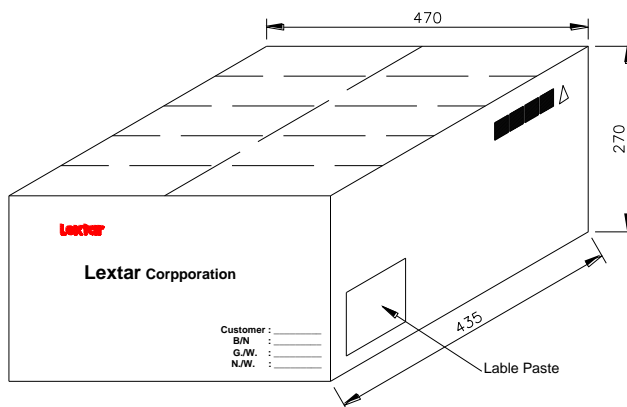
White Carton (Small Package)
230(L)mm x 85(T)mm x 265(H)mm
5 Reels inside per carton

Middle-Size Carton :
6 Small-Size Cartons inside
(30 Reels inside)



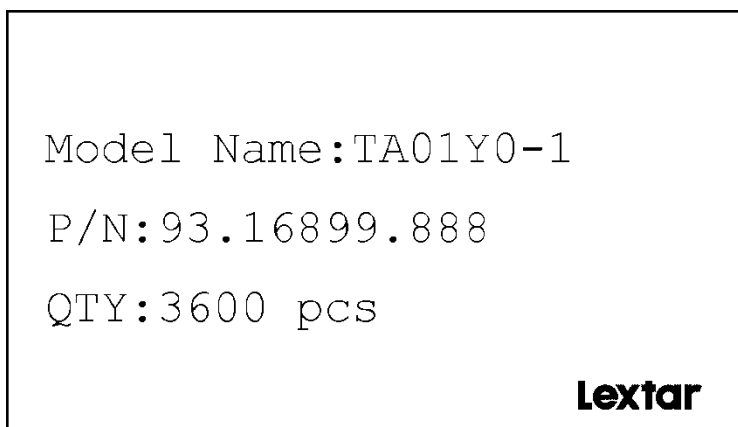
M size Carton (Middle Package)
470(L)mm x 265(T)mm x 270(H)mm
6 white box inside per M-carton
30 Reels inside per M-carton

Large-Size Carton :
10 Small-Size Cartons inside
(50 Reels inside)



L size Carton (Large Package)
470(L)mm x 435(T)mm x 270(H)mm
10 white box inside per L-carton
50 Reels inside per L-carton

Label on Carton:



4 PRECAUTIONS**4.10 Application**

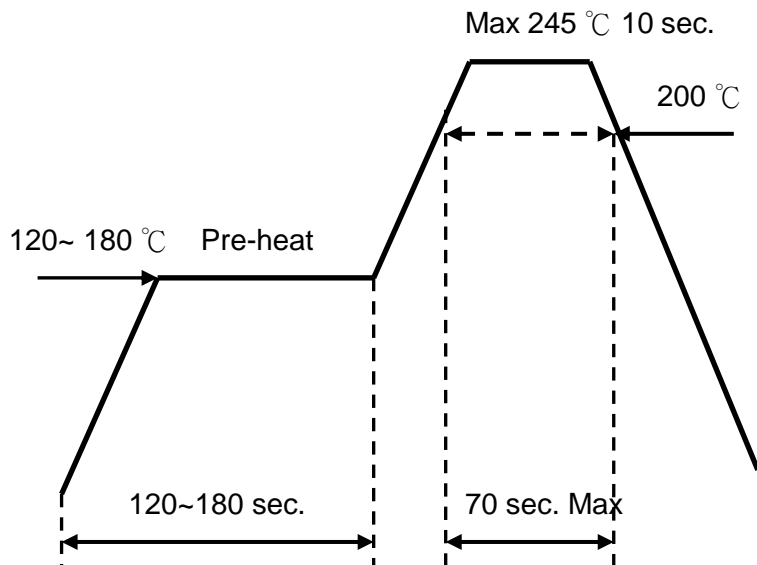
- . The products are not intended to military, aircraft, automotive, medical, life sustaining or life saving applications or any other application which can result in human injury or death. Please be noted that a different product may be required. If you have any concerns, please contact us before using the products in your desired application. This specification guarantees the quality and performance of the products as an individual component. Do not use the products beyond the use case and use environment that the specification has described in this document. We assume no responsibility and liability for any lost and damage resulting from the use or operation of the products which do not comply with any absolute maximum ratings, warnings, restriction and instructions recited in these specification sheets or other forms of notices from us or resulting from the use or operation of the products under non-standard environment or non-regular operations.

4.11 Storage

- Before opening the package, the LEDs should storage under 30°C, 70% RH.
- After opening the package bag, the LEDs should be keep under 30°C, 70% RH. Recommend to use within 168 hours. If unused LEDs remain, suggest to store into moisture proof bag or original package bag with moisture absorbent material such as silica gel. Reseal well is necessary.
- If the product exceeded the storage period or the moisture absorbent material faded away, baking treatment should be done by following conditions.
Bake condition: 60°C, 12hours (One time only).
- **Do not exposed to hazardous materials, such as sulfur, chlorine, phthalate, acid, solvent, etc.**
- **Do not exposed to sunlight environment or store in a dusty environment**

4.12 Soldering

- Do not solder/reflow the same LED over two times.
- Recommend soldering conditions:
Hand soldering: 350 °C max , 3 sec. max.
Reflow soldering: Pre-heat 180 °C max , 180 sec. max.
Peak 245°C max , 10 sec. max.
- Reflow temperature profile as below: (lead-free solder)



- When soldering, don't put stress on the LEDs
- After LEDs have been soldered, strongly recommend not to repair to keep the LEDs performance.
- **When using a pick and place machine, choose a pick and place nozzle with a larger diameter than the LED's emitting surface. Otherwise, the LEDs may be damaged and failure of lighting.**

4.13 Handling

- **Do not apply mechanical stress on the surface of the encapsulant or stack the LEDs together, it may cause the LEDs to be scratched or failure of lighting.**
- **When handling the LEDs with tweezers, the LEDs should be grabbed from the side.**
- **Do not drop the LEDs, it may cause damage to the LEDs.**

4.14 Using

- **Do not contact with hazardous materials such as sulfur, chlorine, phthalate, acid, solvent, etc. These materials may cause LED's brightness degradation or failure of lighting.**

- VOCs (Volatile Organic Compounds) can be released from parts of luminaries fixtures such as adhesives glue, cleaning flux, housing, lens or organic additive. When the LEDs are exposed to a VOCs-containing environment, the LEDs will discolor and cause lumen degradation significant, especially the LEDs are used in a closed environment. Users must carefully choose these materials to ensure that there are no issues.
- The applied electric and temperature environment should not exceed the maximum specification limitation.
- Electrical Over Stress (EOS) will apply a surge current to the LEDs and cause damage such as lumen degradation or failure of lighting. If user's devices have such problem, it can to be avoided by adding a surge protection circuit.

4.15 Cleaning

- If washing is required, recommend to use **IPA** as a solvent.
- Recommend to avoid cleaning the LEDs by ultrasonic. If necessary, pre-test the LED is necessary to confirm whether any damage occur after the process.

4.16 Thermal Management

- The thermal design of the end product must be seriously considered, particularly at the beginning of the system design process.
- LED junction temperature(Tj) is affected by PCB thermal resistance and LED spacing on the board.
- The following equations can be used to calculate LED junction temperature

$$T_j = T_s + R_{thjs} \times W$$

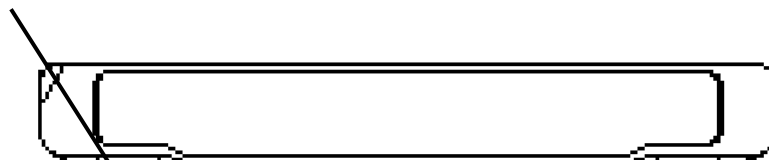
$$T_j = \text{LED junction temperature: } ^\circ\text{C}$$

$$T_s = \text{Soldering temperature (cathode side) : } ^\circ\text{C}$$

$$R_{thjs} = \text{Thermal resistance from junction to } T_s : ^\circ\text{C/W}$$

$$W = \text{Input power}(I_F \times V_F) : \text{W}$$

Ts Measurement Point



4.17 Static Electricity

- LED package is extremely sensitive to static electricity. It's recommended that anti-electrostatic glove and wrist band is necessary when handling the LEDs. All devices are also be grounded properly as well.
- Protection devices design should be considered in the LED driving circuit.

4.18 Eye Safety

- In 2006, the International Electrical Commission (IEC) published IEC 62471:2006 Photobiological safety of lamps and lamp systems, which includes LEDs within its scope.
Most of the white LEDs can be classified as belonging to either Exempt Group or Risk Group 1.
- The LED light output is too strong for human eyes without shield. Prevent eye contact directly more than seconds.
- Ensure operating under maximum rating.
-

7 Miscellaneous

- All measurement data is taken from standard experiment procedure and environment with conditions on each discrete product, which is not integrated with other components and materials which are not provided by us. Therefore the measurement result is just provided for reference and evaluation. The products should always be cautiously used with other parts not supplied by us. It is your or your customer's responsibility to perform sufficient verification under your expected environment prior to use the products with other parts to ensure that the lifetime and other quality characteristics required for the intended use in real life are met. It is recommended to consult with us instantly while there is any concern or inconsistency about the LED operation under certain environment and procedure. It is highly possible to cause malfunctions or damages to the products or risks of life or health under non-standard environment and operations.
- 所有量測數據為單一產品於標準實驗室程序測得結果，僅供參考評估。如需評量特定非實驗室測試環境，請務必與我們聯絡，若您或您的客戶於實際應用上需要與非本公司提供之產品與元件結合或搭配使用，請務必於實際販售使用前就該結合與搭配之成品於可能的使用環境上進行充分之驗證以確保能達成你們預期之功效，規格與功能。如本產品在特定環境下之運用有任何疑問或不一致情事，應立即與我們諮詢。如本產品係在非標準環境下運用與運行，將有高度可能發生故障、產品損毀或人身傷害。
- You will not reverse engineer, disassemble or otherwise attempt to extract knowledge/design information from the products. In the case of any incident or

quality concern that appears to be in breach of these specifications, the products in question must be reported to our local sales representatives to discuss instructions on how to proceed while ensuring that the products in question are not disassembled or removed from the PCBs(if any). The determination of whether the products in question are defective and are required for any corrective action thereafter shall be made by us in accordance with our cause analysis procedure. If you do not agree with our cause analysis result for a quality issue, you may request us to send the products in question to a mutually agreed third party for inspection. The cost of such third party inspection shall be borne by you unless it is determined by such third party that said quality issue is solely attributable to us. In the above case, our sole and exclusive obligation shall be, either to repair, replace or refund the products in question to the extent commercially practicable with the products without such quality issue.

- 您們不得將本產品進行任何逆向工程、拆解或以其他任何方式企圖自本產品取得技術/設計相關資訊。如有發現所出售之產品任何與本說明書內容不符或甚至品質疑慮之情形，您們應立即向我們當地業務匯報該等有疑問的產品以討論後續處理方式，且不得自行拆解或分析本產品。本產品是否有任何可歸責於我們之問題且應由我們修正，應由我們根據我們頒佈的真因分析程序確認。如果您們不同意我們的真因分析結果，可另外將有疑問的產品寄給雙方同意的中立第三方驗證，所產生費用應由您們概括承擔，除非該第三方認定瑕疵完全係我們造成。如為我們所造成之瑕疵，我們僅在商業上可行範圍內，維修、退換貨有疑問的產品之責任。
- All previous negotiation and agreements not specifically incorporated herein are superseded and rendered null and avoid. We assume no liability with respect to defects and/or issues of the products caused by:
 - (a) alternation, modification or change of the products by someone other than us;
 - (b) attempt by someone other than us to repair the products;
 - (c) not our negligent, gross negligent, reckless, or other improper use of the LEDs;
 - (d) installation, operation, or maintenance of the products by someone other than us and not in a manner described in the instruction manual, if applicable; and
 - (e) combination of products by someone other than us with those not supplied by us.
- 除非本規格書有所載明，本規格書取代雙方以往一切口頭、書面或默示之約定、承諾與協議。我們對於以下情形所造成之損害或爭議不負擔任何責任：**(a)** 非我們所為之本產品變更、修正或修改；**(b)** 我們以外之第三人企圖修補本產品；**(c)** 非我們之故意、過

失、重大過失、輕率魯莽或其他任何關於本產品之不當使用；(d)非遵守我們指示、說明且非我們所為之本產品安裝、運行或維護；(e) 我們以外之第三人將本產品與其他軟硬體產品或服務相結合且若無該結合將不致引起本侵權主張。

8 LIMITED WARRANTY

The applicable warranty period is 12 months from the date that the products are manufactured.

- 本產品保固期間為自製造日起 12 月。

9 DISCLAIMERS:

- REPAIR, REPLACE OR REFUND OF THE PRODUCTS SHALL CONSTITUTE THE EXCLUSIVE REMEDY FOR A BREACH OF THIS LIMITED WARRANTY, AND WE WILL NOT BE LIABLE FOR ANY CONSEQUENTIAL DAMAGES, PERSONAL INJURY, LOSSES, DAMAGES, OR EXPENSES DIRECTLY OR INDIRECTLY RESULTING FROM THE USE OF THE PRODUCTS. LIABILITY OF US TO YOU OR CUSTOMER FOR PRODUCTS SHALL BE LIMITED TO THE NET SALES AMOUNT OF THE PRODUCTS SOLD TO CUSTOMER. WE DISCLAIM ALL OTHER WARRANTIES, EXPRESS OR IMPLIED INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.
- 維修、退換貨為我們根據規格書內容所負擔之唯一賠償方法，故我們對於使用本產品所致之一切附隨損失、人身、傷害或其他直接或間接損失、損害或費用，概不負擔任何金錢賠償責任。如有任何其他可歸責於我們之情事，我們對於客戶所負擔的金錢賠償責任應以我們賣給客戶的產品淨銷售額為上限。我們對於本產品並無提供其他任何明示或默示之擔保，包括但不限於默示擔保其具有通常效用。
- BOTH PARTIES INTEND TO AGREE ON THE OFFICIAL SPECIFICATIONS FOR THE SUPPLIED PRODUCTS BEFORE ANY PROGRAMS ARE OFFICIALLY LAUNCHED SUCH AS BEFORE THE MASS PRODUCTION LAUNCHED. WITHOUT THIS CONSENT AGREEMENT IN WRITING (I.E. PRODUCT SPECIFICATION), THE CONTENT OF THIS SPECIFICATION SHALL BE DEEMED SUBJECT TO CHANGE WITHOUT NOTICE FROM US.
- 本規格書在您量產或銷售之前應由雙方同意。如本規格書未經您們以書面簽署，我們得隨時修改本規格書而自行生效。